

# ADLİ KİMYA; Nutrasötikler & Adli Bilimler

1

PROF. DR. ASLIHAN AVCI

ANKARA ÜNİVERSİTESİ TIP FAKÜLTESİ  
TIBBİ BİYOKİMYA ANABİLİM DALI,  
ADLİ BİLİMLER ENSTİTÜSÜ MÜDÜR YARDIMCISI





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## Nutrasötik;

\*Hastalıkların tedavisinde veya önlenmesinde sağlığa yararları bilimsel olarak ispatlanmış, toksik olmayan, herhangi bir gıda ekstresi.

\*Hastalık riskini azaltan ve sağlık üzerinde yararlı etki gösteren besin maddeleridir. (Dillard & German,2000).

# NUTRASÖTİKLER

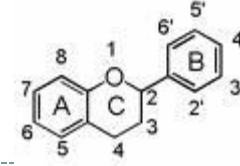
## 1. Fonksiyonel yiyecek ve içecekler:

- Diyabet için
- Kolesterol
- Kognitif fonksiyonlar
- Sindirim sistemi ile ilgili olanlar

## 2. Diyetisel destek ürünleri

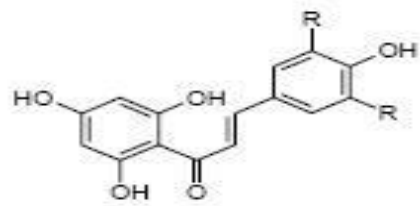
- vitamin ve mineral desteği
- bitkisel destek*
- Protein desteği

# Flavonoidler

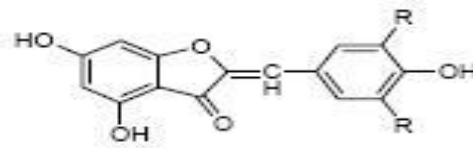


4

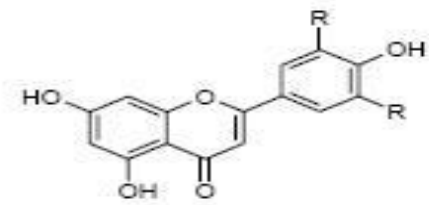
- Flavonoidler, pek çok meyve ve çiçekteki renklerden sorumlu olan bitki pigmentleri grubudur.
- Yiyecekler, meyve suları, bitkiler ve arı poleni (zengin flavonoid içeriği)
- Kimyasal yapılarına göre 4000'in üzerinde flavonoid bileşiği karakterize edilmiştir.



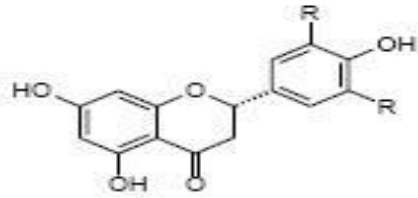
Chalcone



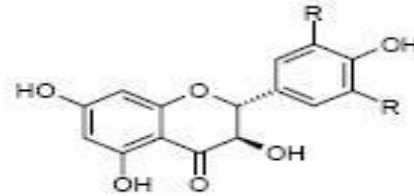
Aurone



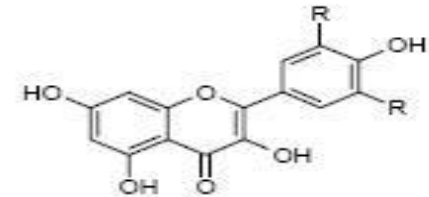
Flavone



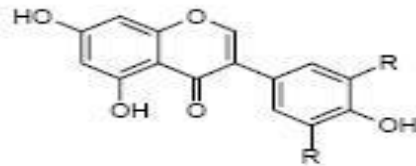
Flavanone



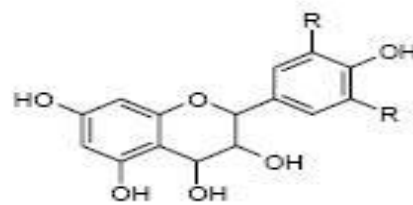
Dihydroflavonol



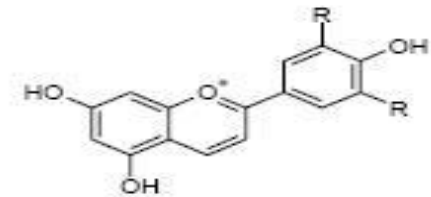
Flavonol



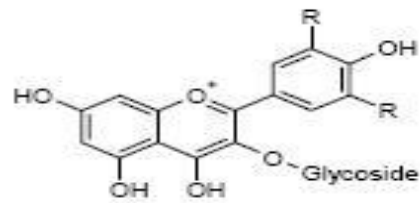
Isoflavone



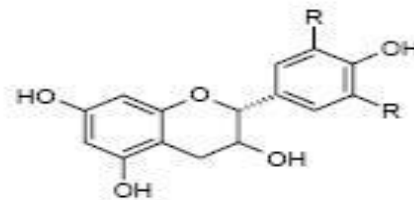
Leucoanthocyanidin



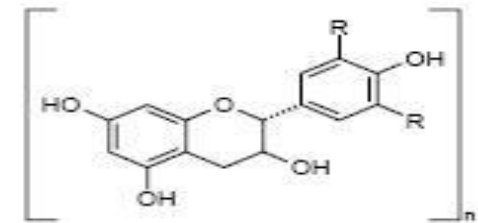
Anthocyanidin



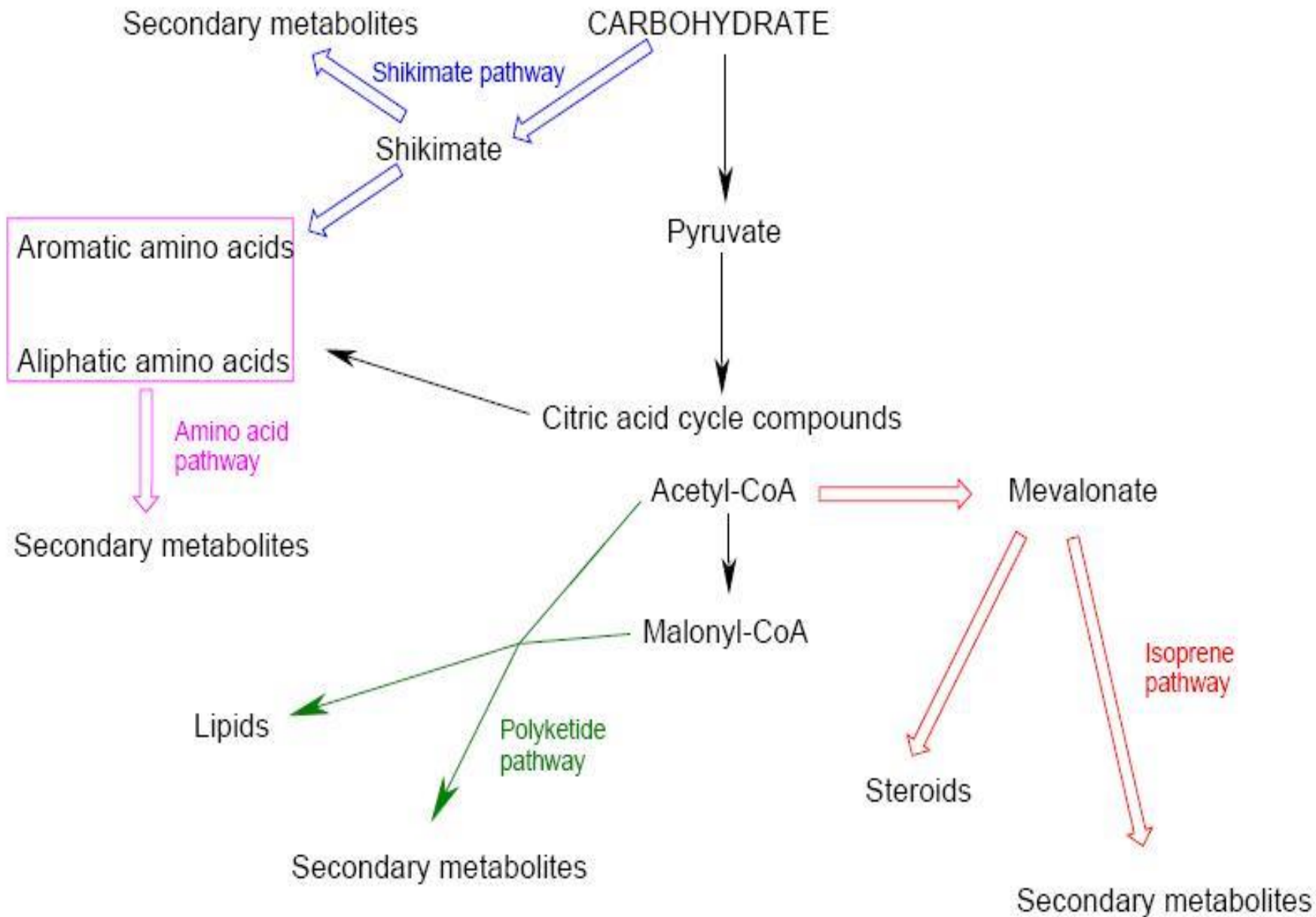
Anthocyanin

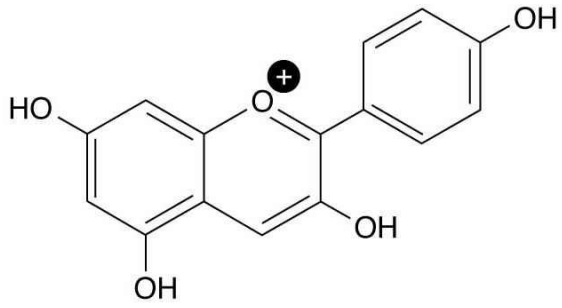


Flavan-3-ol



Proanthocyanidin (n>1)

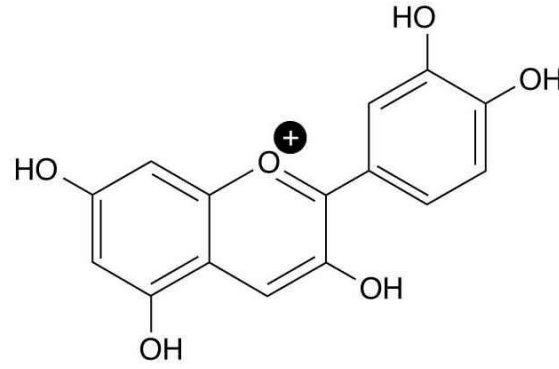




**Pelargonidin**



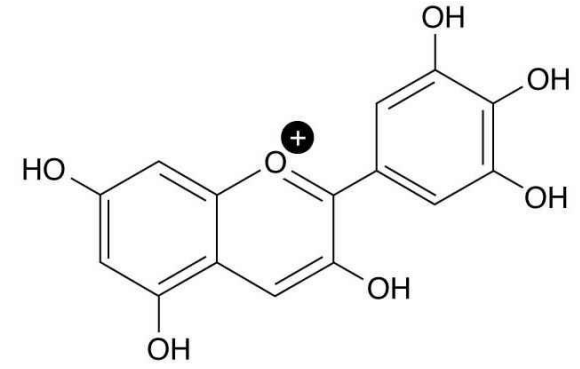
***Pelargonium***  
**(Geranium)**



**Cyanidin**



***Rosa***  
**(Rose)**



**Delphinidin**



***Delphinium***  
**(Larkspur)**

# Flavonoid Kaynakları

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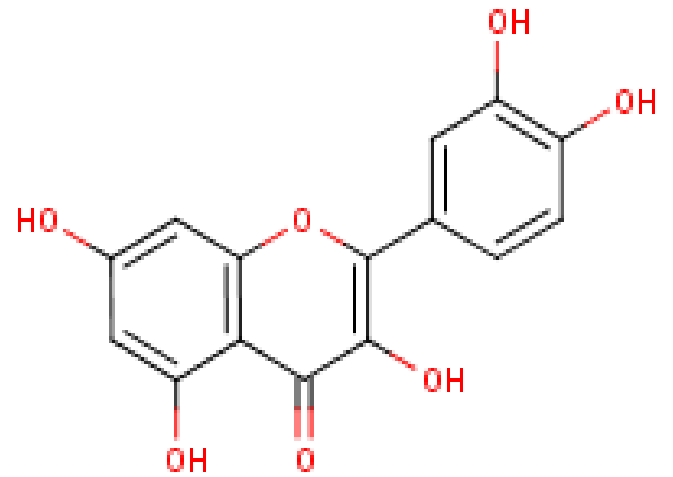
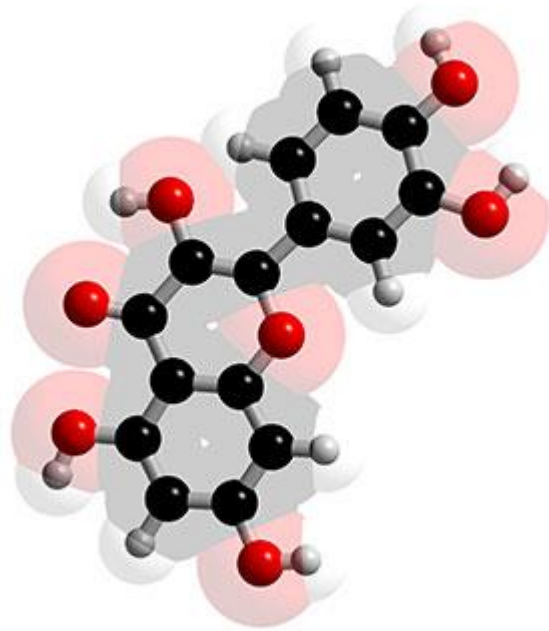
- Turunçgil meyveleri, sulu küçük meyveler, soğanlar, maydanoz, baklagiller, yeşil çay, üzüm
- Besin desteği olarak kullanılan flavonoid-ler:
  - üzüm çekirdeği,
  - yeşil çay,
  - kuşburnu
  - Buğday çimi, ısırgan gibi besin kaynaklarından elde edilir.



# Quersetin

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- Quersetin, deneysel alıřmalarda en aktif flavonoid olarak bulunmuřtur.
- Tıbbi bitkiler aktivitelerinin buyk bir kısmını yksek *Quersetin* ieriklerine borludur.



# Quersetin

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- Flavanooidlerin antioksidan etkileri quersetinin antioksidan aktivitesinden kaynaklanmaktadır.
- Quersetin serbest oksijen radikallerini temizler
- ksantin oksidazı
- invitro kořullarda lipit peroksidasyonunu inhibe eder.

([Boots AW, Haenen GR, Bast A. Health effects of quercetin: From antioxidant to nutraceutical. \*European Journal of Pharmacology\* 2008; 585, Issues 2-3,](#)

# Quercetin

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- Quercetin, kimyasal yapı olarak rutin ve hesperidine benzeyen ve bitkilerde yaygın bulunan bir flavonoiddir
- Özellikle kırmızı üzüm, soğan, elma, greyfurt, çay önemli quercetin kaynaklarıdır.

# Turunçgil Bioflavonoidleri

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- Turunçgil bioflavon preparatları;
- hesperidin
- karsitrin
- naringin içerebilirler.

(Rutin ve ham bioflavonoid kompleksleri ile yapılan klinik arařtırmaların çoęu 1970'lerdedir.)

# Turunçgil Bioflavonoidleri

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- Klinik çalıřmalar:
- hidroksetilrutozidler (HERs) olarak bilinen standardize rutinosisid karıřımları ile yapılmıřtır.
- HERs ile, kapiller geirgenlikte, ürük oluřumuna meyilde, hemoroidde ve varikoz venlerde etkileyici klinik sonular elde edilmiřtir.

Rice-Evans CA, Miller NJ, Paganga G. Structure-antioxidant relationships of flavonoids and phenolic acids. *Free Radical Biol Med* 1996; 20: 933-956.

# Etki ve Farmakoloji

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- anti-enflamatuar,
- anti-allerjik,
- anti-viral
- anti-kanserojenik özellikleri
- allerjenler, virüsler, karsinojenler gibi diğer bileşiklere karşı vücudun yanıtını düzenleme yetenekleri vardır.

# Etki ve Farmakoloji

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- Flavonoidler oksidatif ve serbest radikal hasarına karşı belirgin koruma sağlayan güçlü antioksidanlardır.
- flavonoidlerin antioksidan aktivitesi > C ve E vitaminleri, Selenyum ve Çinko

Rice-Evans CA, Miller NJ, Paganga G. Structure-antioxidant relationships of flavonoids and phenolic acids. *Free Radical Biol Med* 1996; 20: 933-956.

Havsteen B. Flavonoids, a class of natural products of high pharmacological potency. *Biochem Pharmacol* 1983; 32: 1141-48.



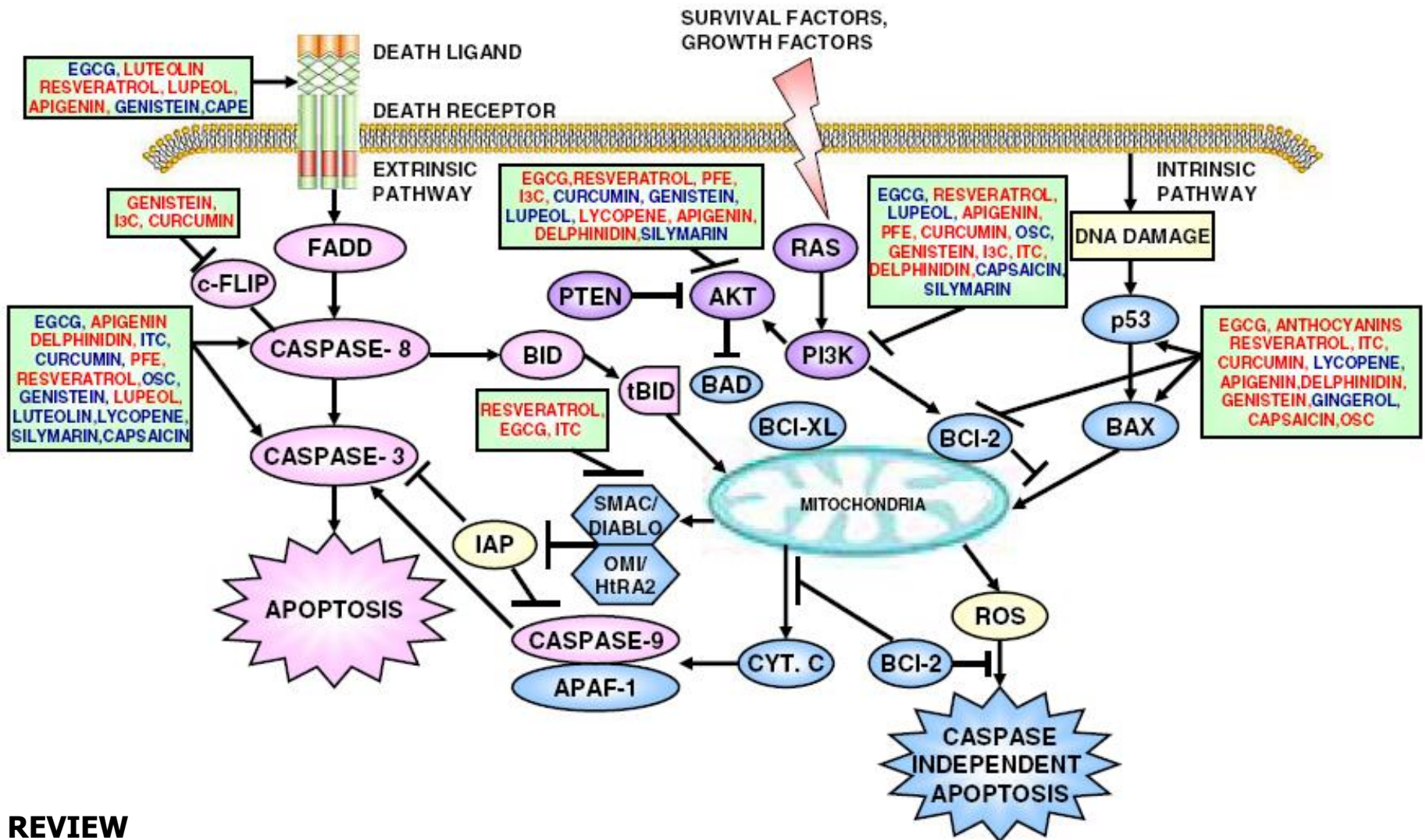
# Apopitoz üzerine etkili flavonoidler

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- Luteolin
- Resveratrol
- Lupeol
- Apigenin
- Genistein
- Curcumin
- Delphinidin
- Capsaicin
- Silymarin
- Epigallocateşin

# Bazı Bitkisellerin Flavonoid İçerikleri;

- Yeşil çay - epigallocatechin gallate (EGCG)
- Üzüm - resveratrol
- Mango, çilek, üzüm - lupeol
- Koyu renkli meyve ve sebzeler (nar, çilek) - delphinidin
- Zerdeçal - curcumin
- Turpgiller - sulforaphane ve diğer isothiocyanates (ITCs)
- Sarımsak - organosulfur bileşikleri
- Domates - lycopene
- Soğan, domates - quercetin
- Devedikeni - silymarin
- Soya fasulyesi - genistein



## REVIEW

### APOPTOSIS BY DIETARY FACTORS: THE SUICIDE SOLUTION FOR DELAYING CANCER GROWTH

Naghma Khan, Farrukh Afaq and Hasan Mukhtar\*

Department of Dermatology, University of Wisconsin, Madison, WI 53706, USA.

**Carcinogenesis Advance Access published December 6, 2006**

# Review of Abnormal Laboratory Test Results and Toxic Effects Due to Use of Herbal Medicines

*Amitava Dasgupta, PhD*

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**Key Words:** Herbal medicine; Abnormal test result; Interference; Drug-herb interactions

DOI: 10.1309/P024K7VRDDPJCTVN

*Am J Clin Pathol* 2003;120:127-137  
DOI: 10.1309/P024K7VRDDPJCTVN

# Effect of Herbal Medicines on Clinical Laboratory Testing

Abnormal laboratory test results due to the use of herbal medicines can be classified in 3 categories:

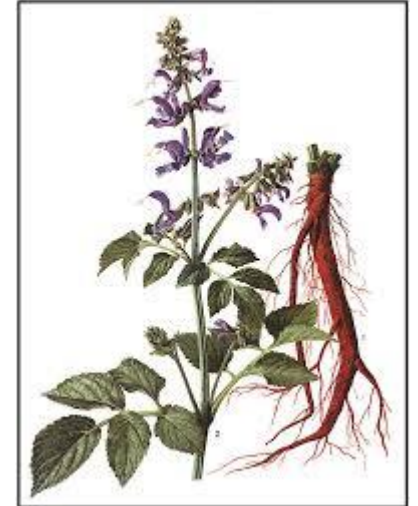
1. Abnormal test results due to direct interference of a component of the herbal medicine with the assay
2. Unexpected concentration of a therapeutic drug due to drug-herb interactions
3. Abnormal test results due to toxic effects of the herbal product

**Table 2**  
**Interference of Herbal Products in Therapeutic Drug Monitoring of Digoxin\***

Herbal Product	Level of Interference	Comments
Chan Su	High	Chan Su has active components such as bufalin, which cross-react with digoxin assays; only Bayer assay has no interference; monitoring free digoxin also eliminates interference
Dan Shen	Moderate	Falsely elevated (FPIA) or falsely low (MEIA) digoxin level; no interference with EMIT, Bayer, Randox, Roche, or Beckman assays; monitoring free digoxin eliminates interference
Uzara root (diuretic)		Additive effect with digoxin; also interferes with digoxin assay
Siberian ginseng	Moderate	Falsely elevated (FPIA) or falsely low (MEIA) digoxin level; no interference with EMIT, Bayer, Randox, Roche, or Beckman assays; monitoring free digoxin does not eliminate interference
Asian ginseng	Moderate	Falsely elevated (FPIA) or falsely low (MEIA) digoxin level; no interference with EMIT, Bayer, Randox, Roche, or Beckman assays; monitoring free digoxin does not eliminate interference

FPIA, fluorescence polarization immunoassay; MEIA, microparticle enzyme immunoassay.

\* Bayer Diagnostics, Tarrytown, NY; Roche Diagnostics, Indianapolis, IN; Beckman Coulter, Fullerton, CA.





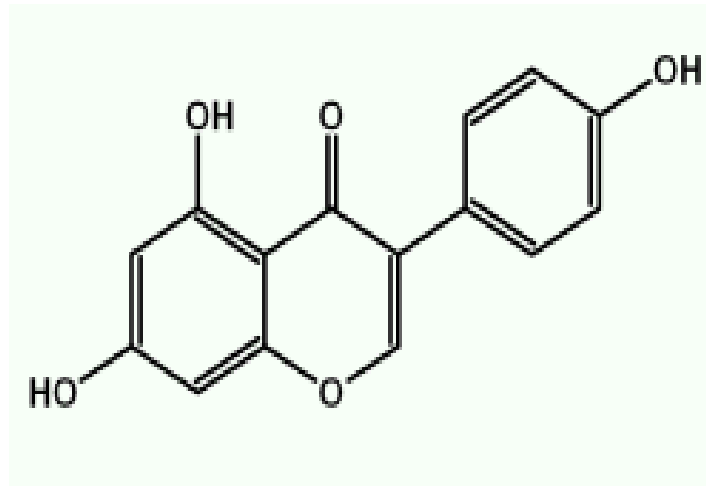
Several reports describe unexpected low concentrations of certain therapeutic drugs due to concurrent use of St John's wort. Johne et al<sup>29</sup> reported that 10 days' use of St John's wort resulted in a decrease of trough serum digoxin concentrations by 33% and peak digoxin concentration by 26%. Durr et al<sup>30</sup> confirmed the lower digoxin concentrations in healthy volunteers who concurrently took St John's wort. The authors also demonstrated that St John's wort activates cytochrome P-450 mixed-function oxidase liver enzymes (CYP3A4) responsible for metabolism of digoxin





# SOY ISOFLAVONES

Genistein, Daidzein, Glycitein, Equol



**Genistein**

4',5,7-Trihydroxyisoflavone

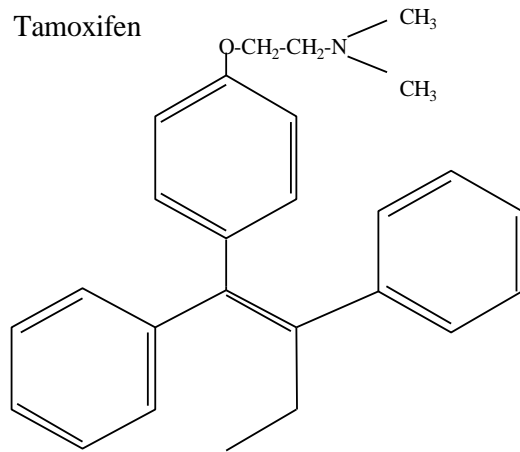
**Omer Kucuk, MD**

**Department of Hematology & Oncology**

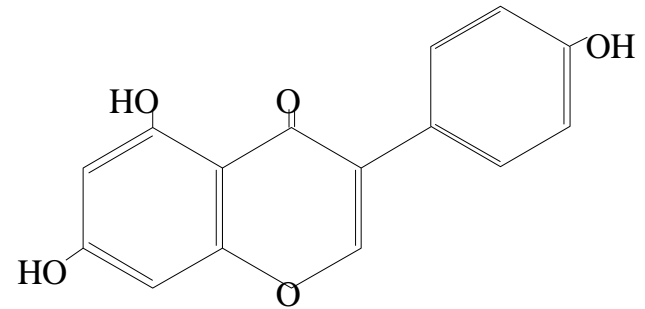
**Emory University, Winship Cancer Institute**

**Atlanta, GA**

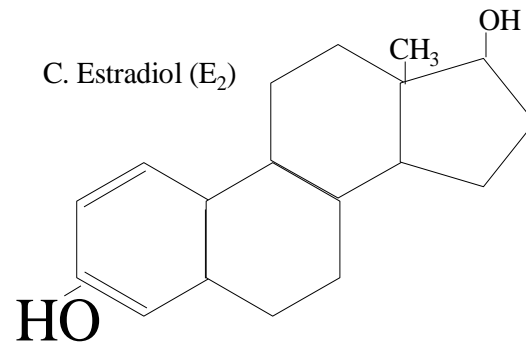
A. Tamoxifen



B. Genistein



C. Estradiol (E<sub>2</sub>)



# Genistein;

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- Genistein apopitozu indükler,
- G2/M döngüsü arrestiyle büyümenin inhibisyonu
- cyclin B1, CDKs, Bcl-2/Bcl-xL'nin down regülasyonu
- Bax ekspresyonunun upregülasyonu

**Estrogens are the most important risk factors in breast and endometrial cancer.**

- 
- 

Inhibition of sex steroid signaling is important for prevention of hormone dependent cancer.



**Phyto-nutrients such as lycopene caused epigenetic changes in the histone acetylation status in the promoters of estrogen dependent genes**

Histon asetilation/deasetilasyon by nutrients

Joseph Levy,

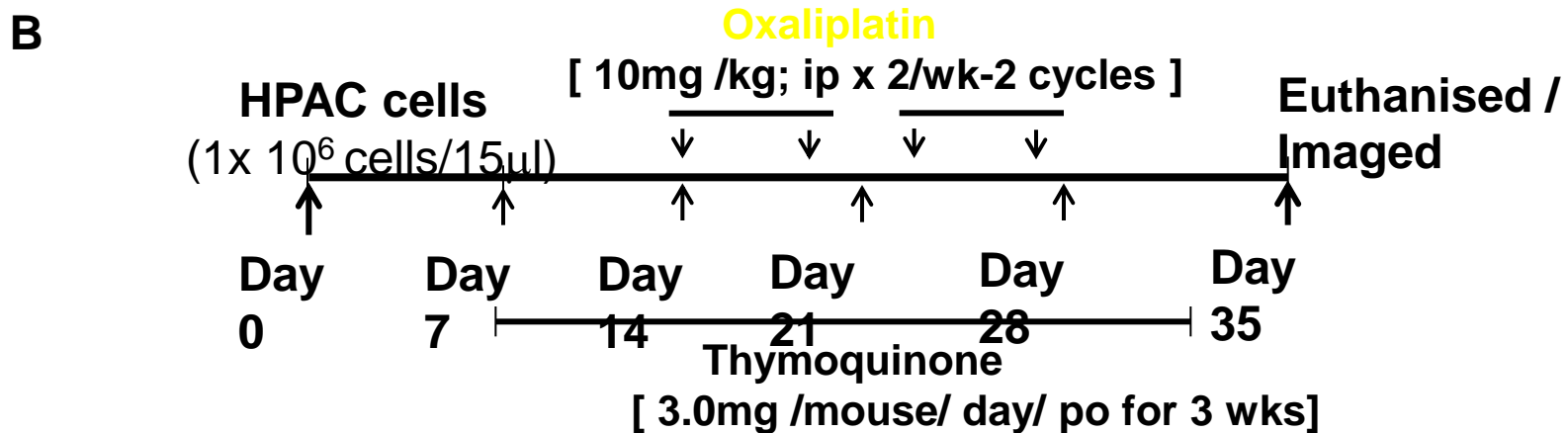
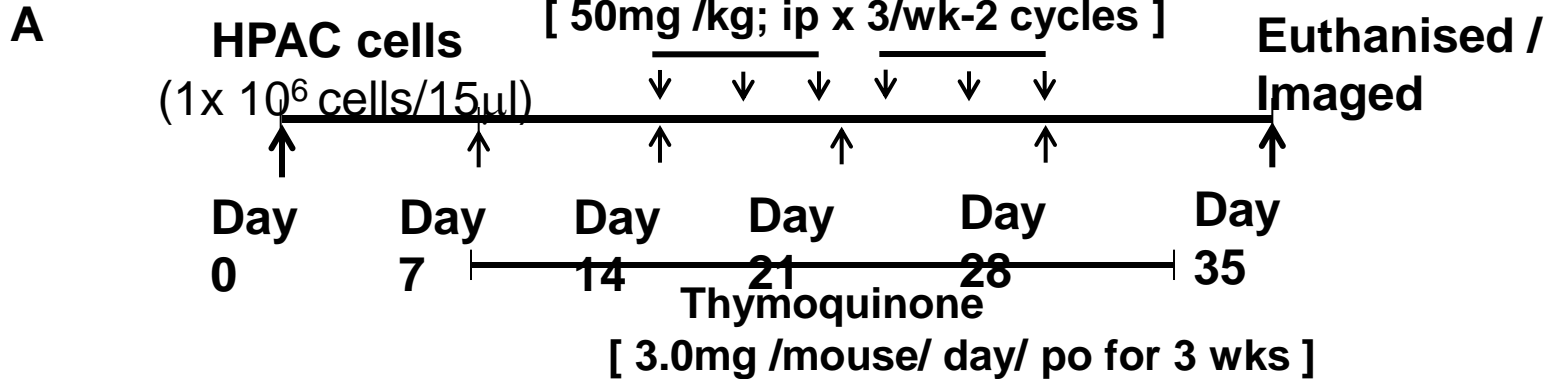
Faculty of Health Sciences, Ben-Gurion University and Soroka Medical Center, Beer-Sheva, Israel



# Treatment Schedule and Experimental Design

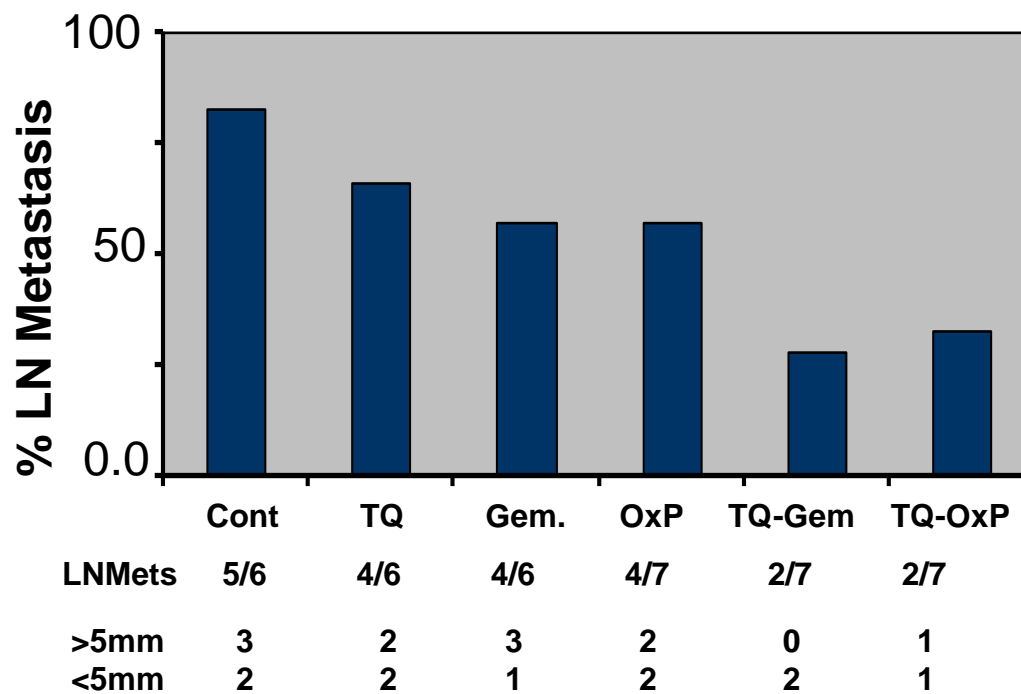
ICR SCID mice  
Female (6-7 wks)

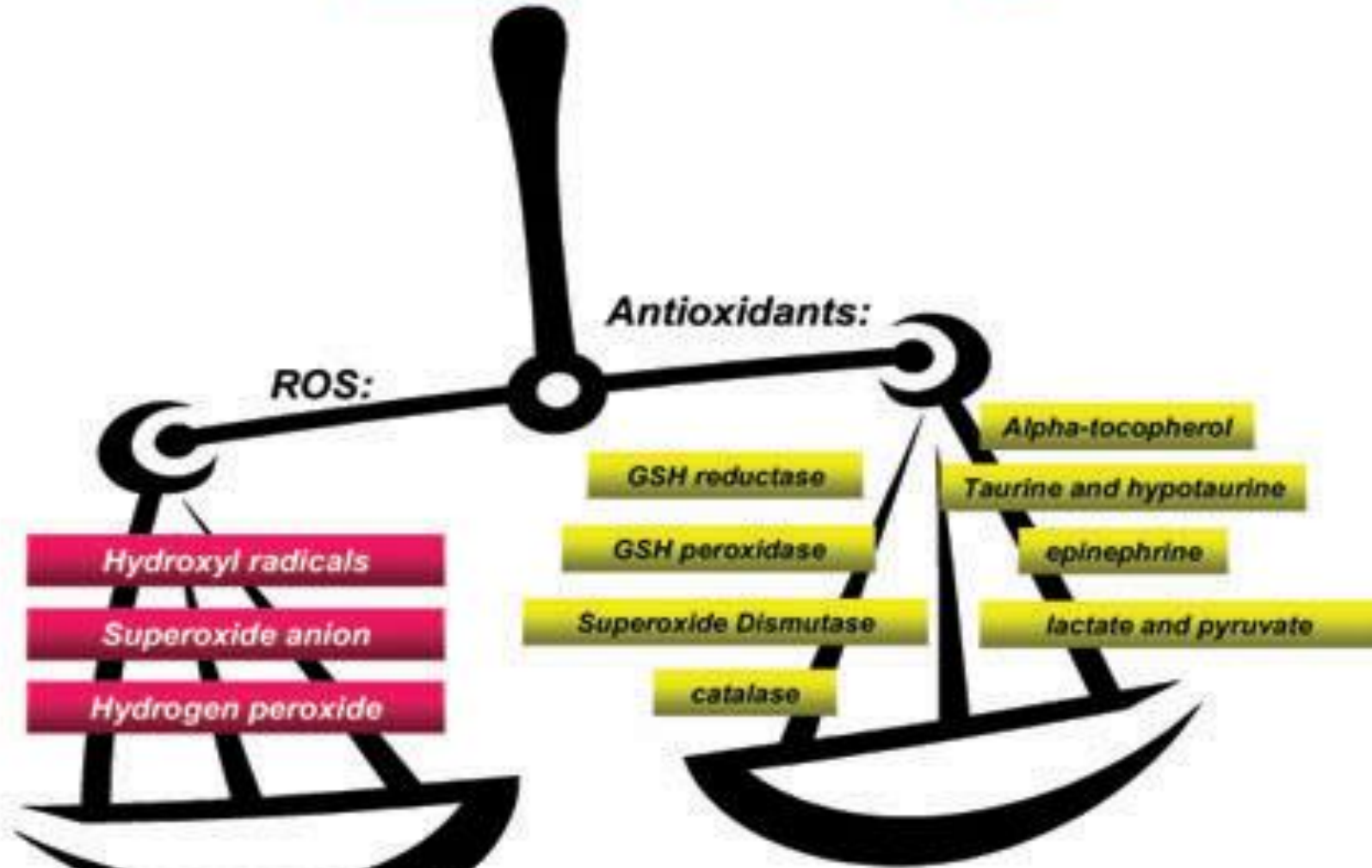
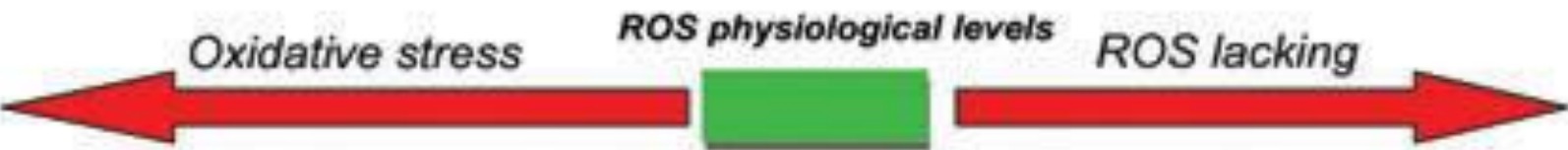
## Gemcitabine

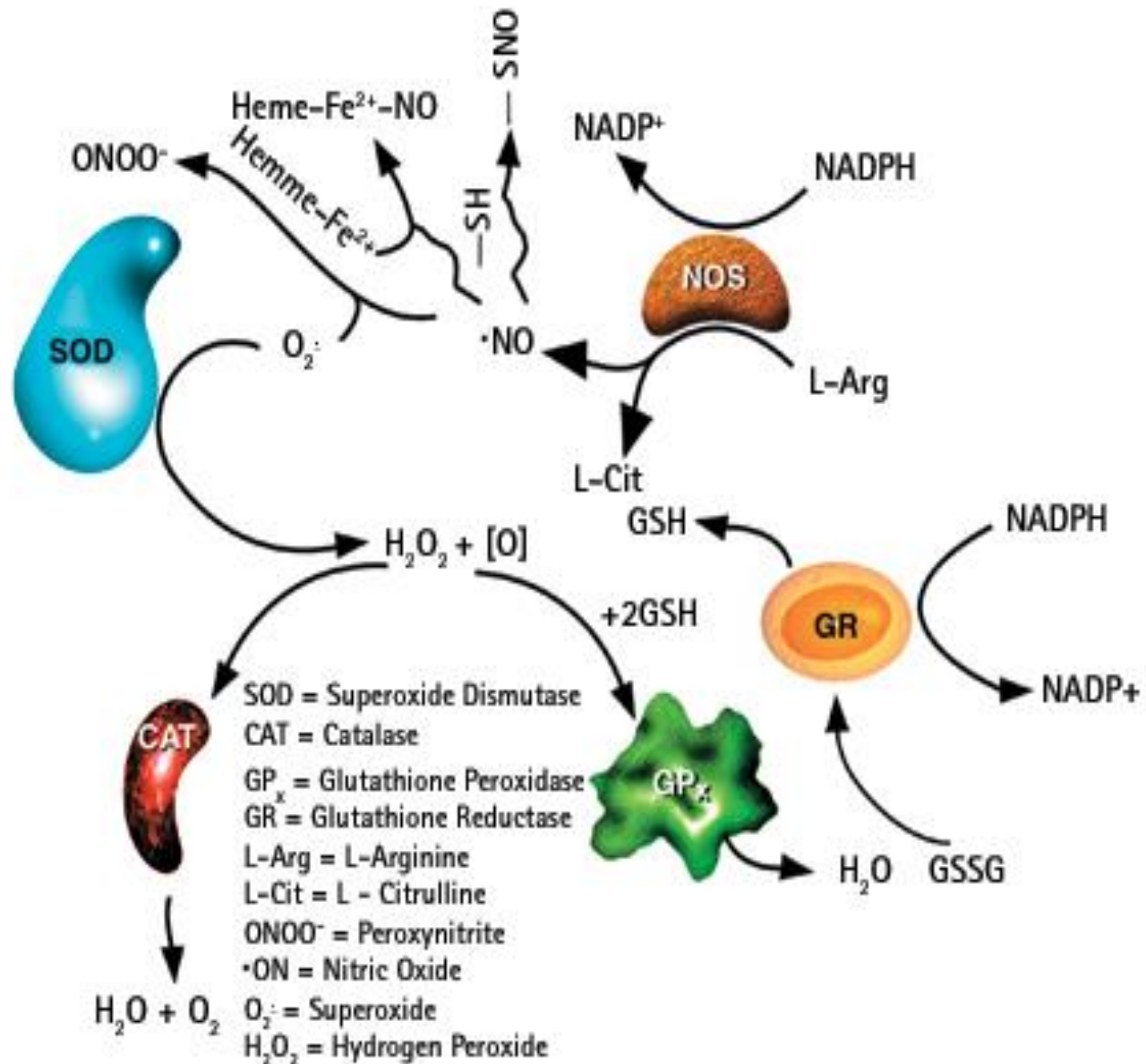


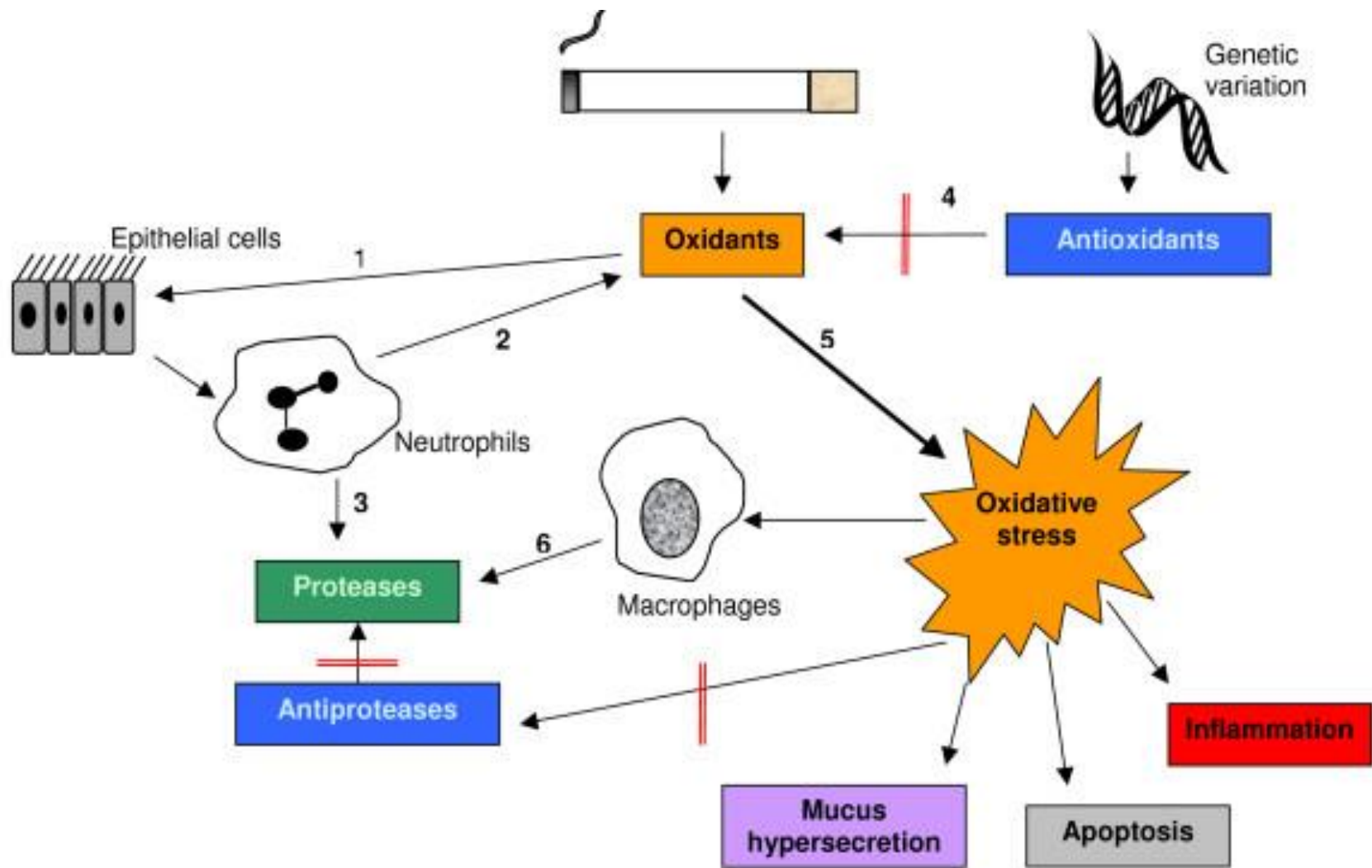


## Pancreatic tumor weight and LN metastasis on day 35



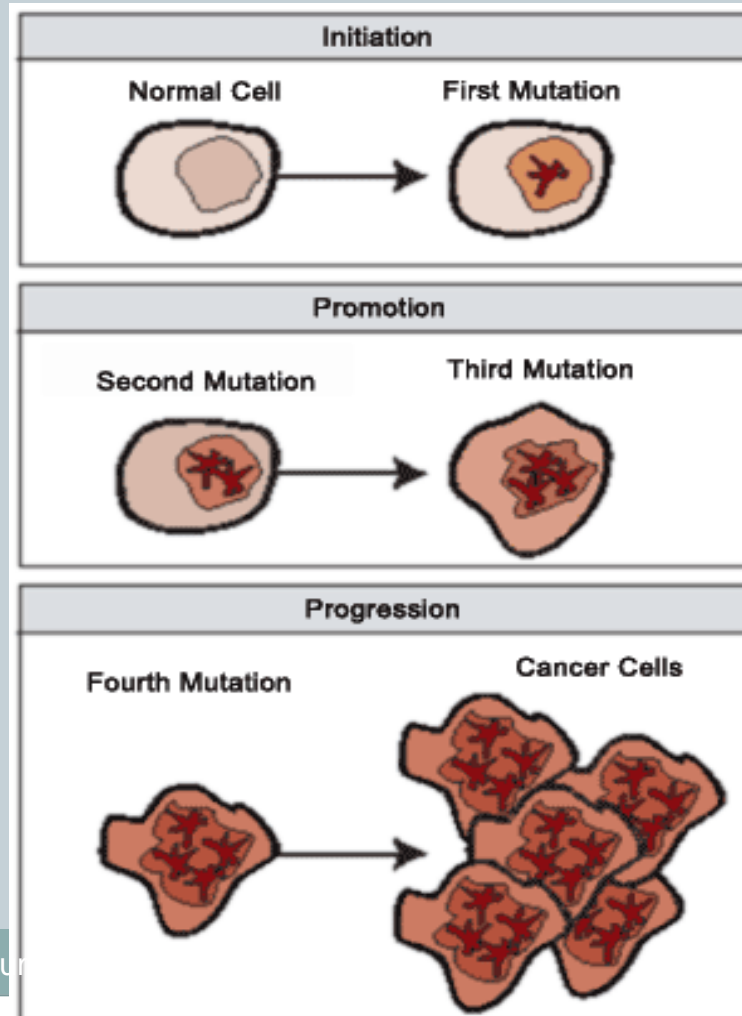


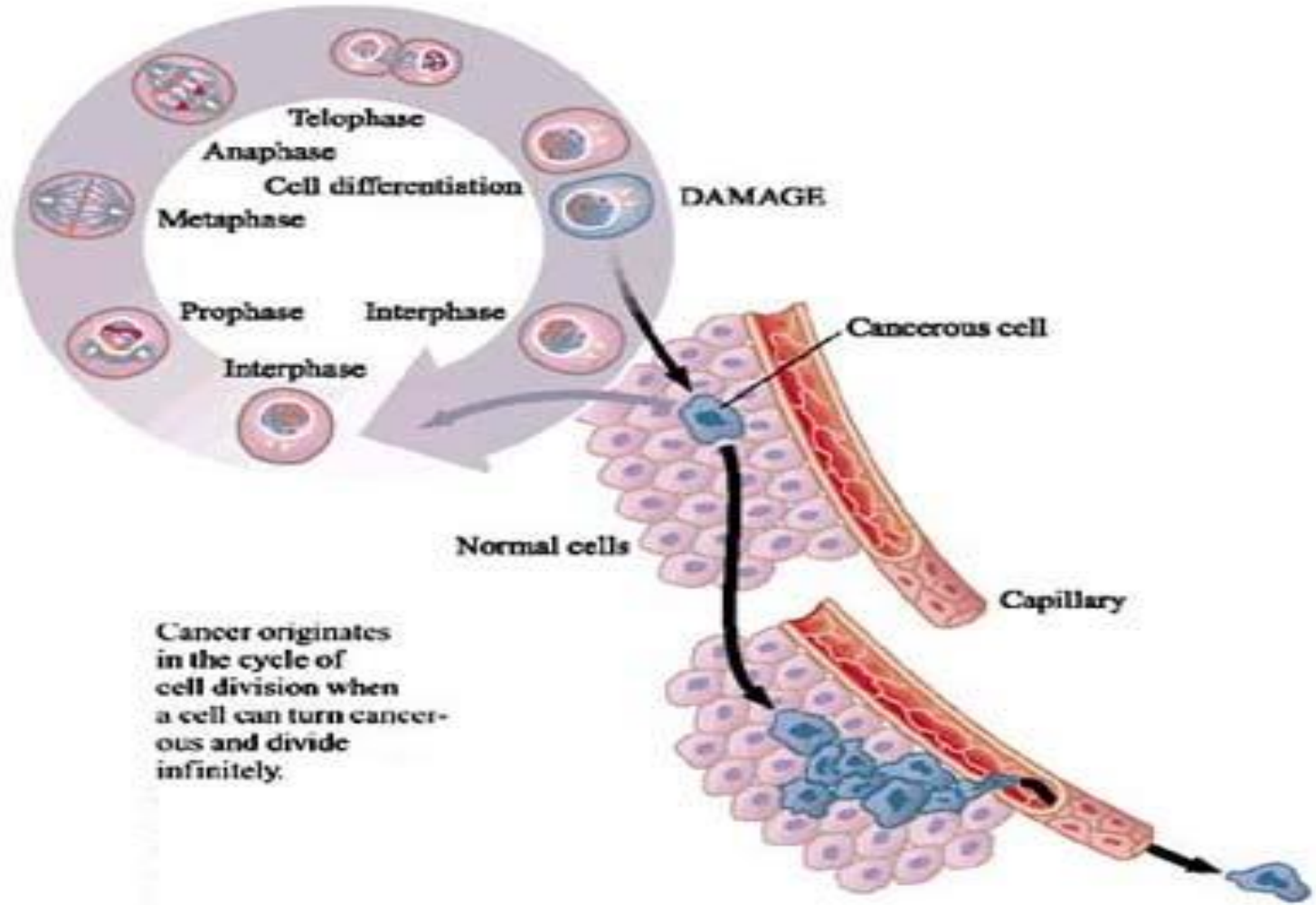




# Kanser

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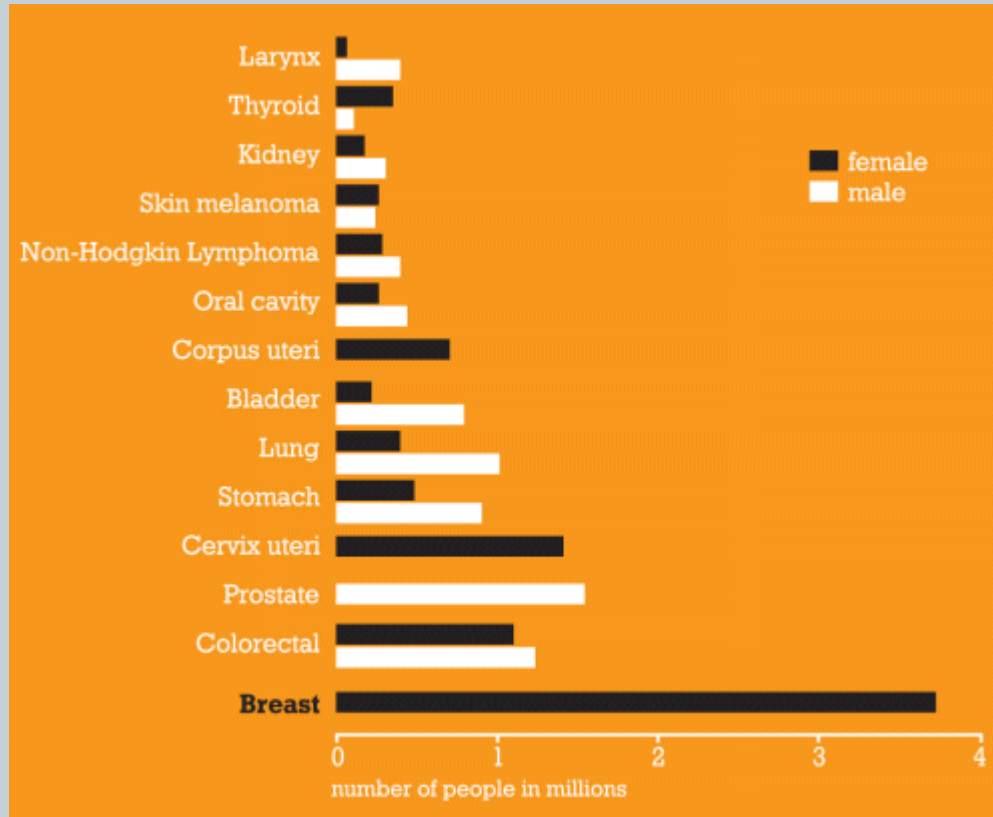




Cancer originates in the cycle of cell division when a cell can turn cancerous and divide infinitely.

# Kanser sıklığı

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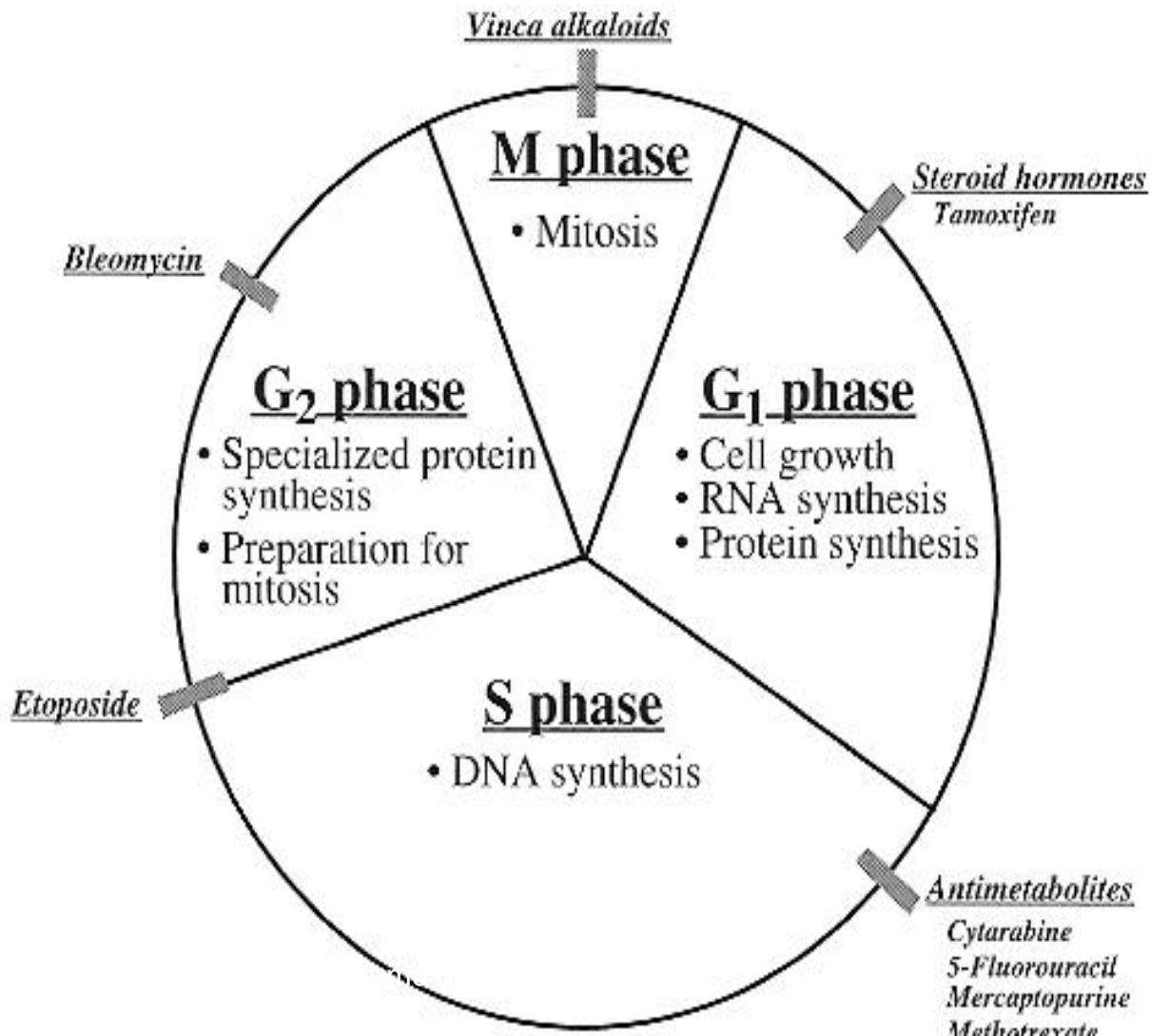


World Health Organization (WHO) International Agency for Research on Cancer: World Cancer Report 2003)



# Kemoterapötikler

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## **CCNS drugs**

- Alkylating agents  
*Cisplatin*  
*Mitomycin*
- *Dactinomycin*
- *Doxorubicin*  
*Daunorubicin*  
*Mitoxantrone*



# Kemoterapötiklerden;

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- Taxol (porsuk ağacı)



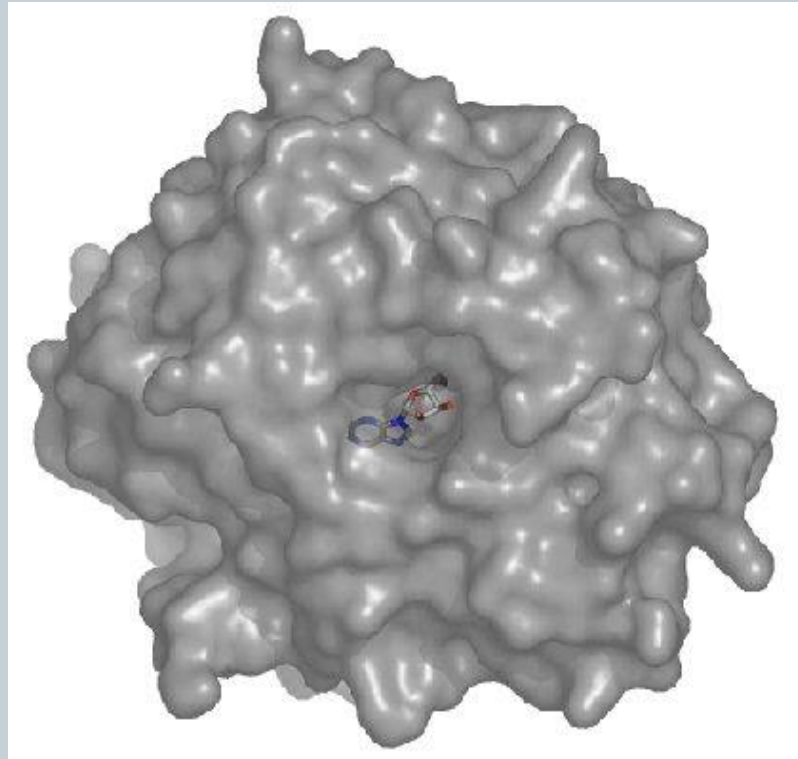
# Cezayir menekşesi

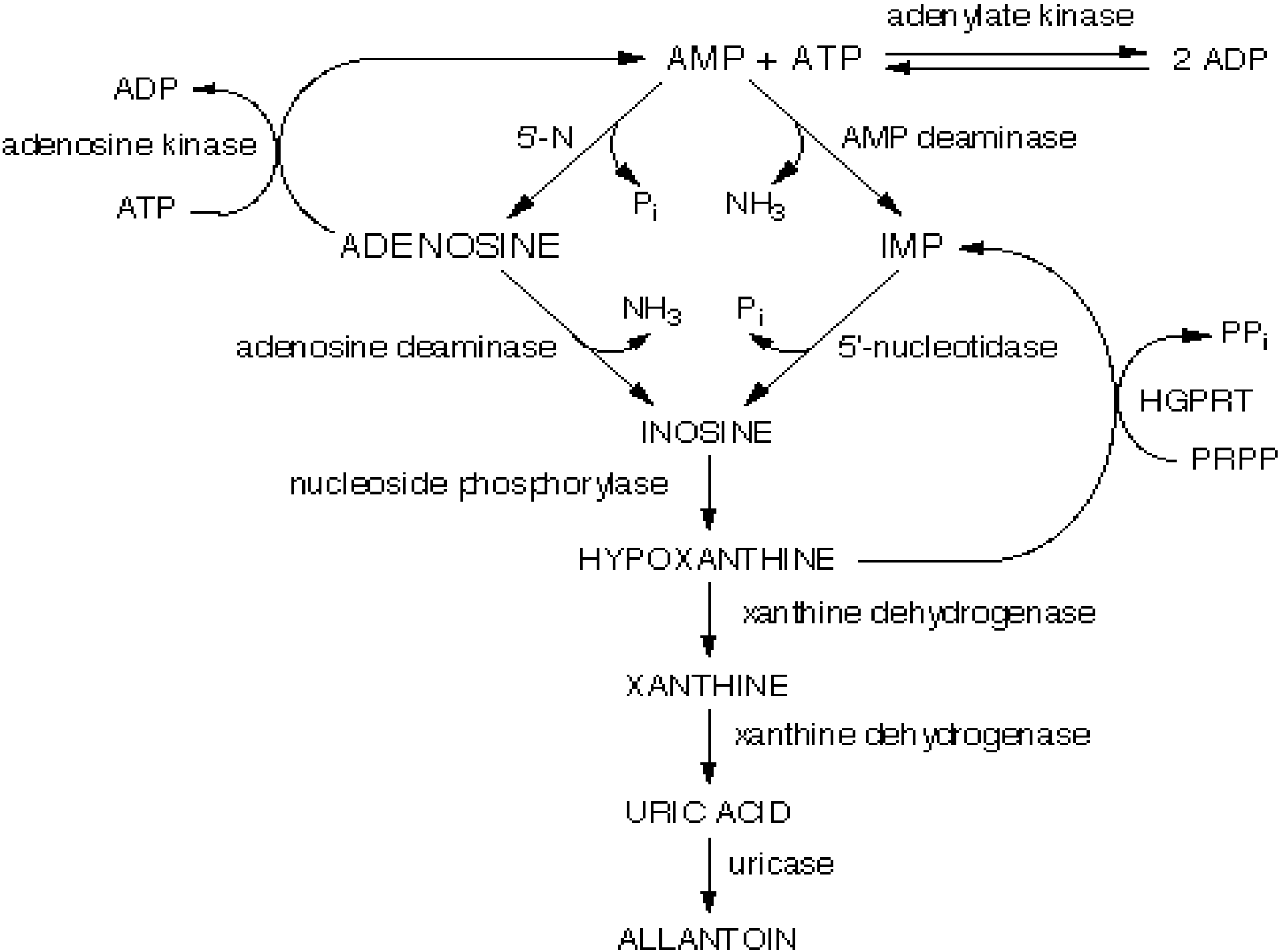
- *Catharanthus roseus*  
(Vinca alkaloidleri)



# Adenozin Deaminaz

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# *Lycopersicon* <sup>45</sup> *esculentum*

- **Domates (*Lycopersicon esculantum*):**
- Domates likopen, C vitamini, A vitamini,  $\alpha$ - ve  $\beta$ -karoten, potasyum, folik asit ve E vitamininden zengin bir yapıya sahiptir.

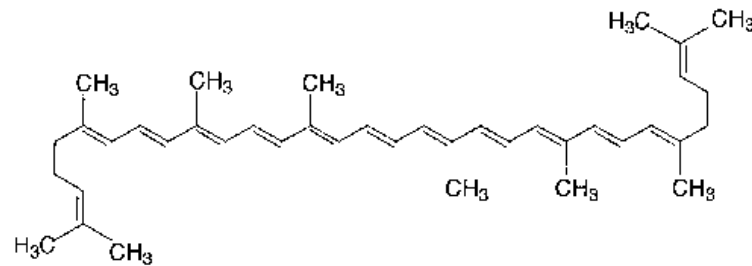


Table 1: Inhibitory effects of tomato juice on ADA activity (mIU/L) in prostate tissue from patients with prostate cancer

Amounts:	Mean ± Standard Deviation
A-No tomato juice	15.82 ± 6.36
B-25 µl tomato juice	8.85 ± 2.96
C-50 µl tomato juice	6.07 ± 2.64
D-100 µl tomato juice	4.03 ± 1.93
Paired t-test statistics	
A-B	P < 0.01
A-C	P < 0.01
A-D	P < 0.001
B-C	P < 0.01
B-D	P < 0.001
C-D	P < 0.05

Durak İ, Biri H, **Avci A**, Sözen S, Devrim E. Tomato juice inhibits adenosine deaminase activity in human prostate tissue from patient with prostate cancer. *Nutrition Research*, **23**:1183-1188 (2003)

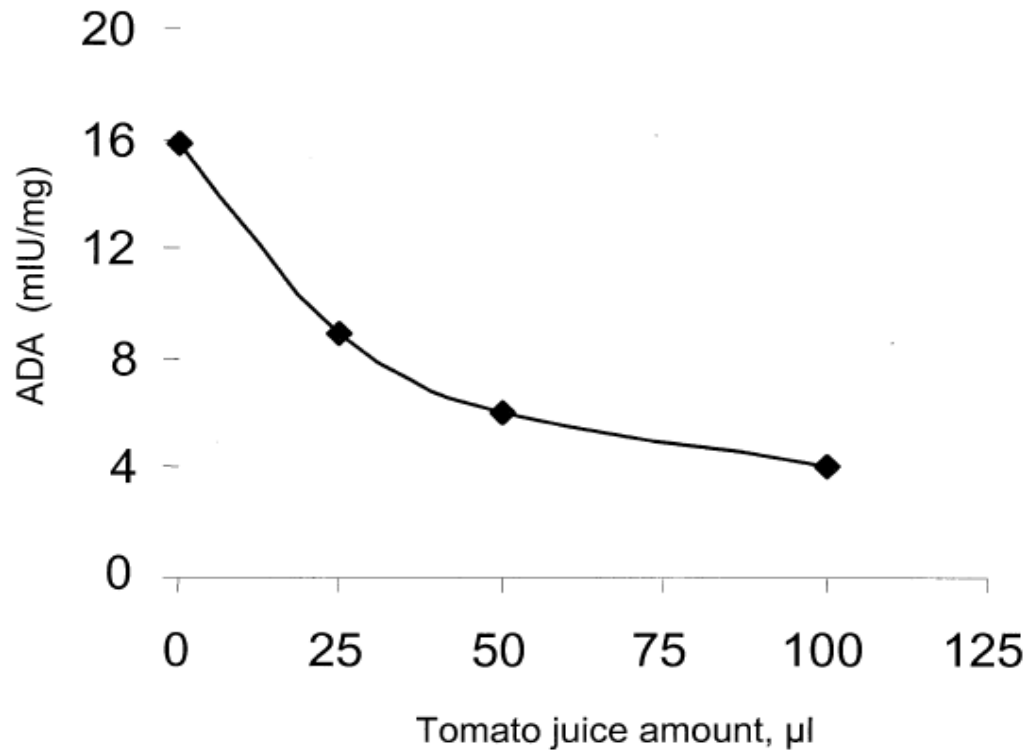


Fig. 1. Prostate tissue ADA activities at different amounts of tomato juice.

Table 2: Effects of different amounts of tomato juice on inhibition percents of ADA activities

Amounts:	Inhibition %
A-No tomato juice	0
B-25 µl tomato juice	32.58 ± 9.17
C-50 µl tomato juice	50.27 ± 10.09
D-100 µl I tomato juice	70.12 ± 5.15
Paired t-test statistics	
A-B	P< 0.001
A-C	P< 0.001
A-D	P< 0.001
B-C	P< 0.01
B-D	P<0.001
C-D	P< 0.01



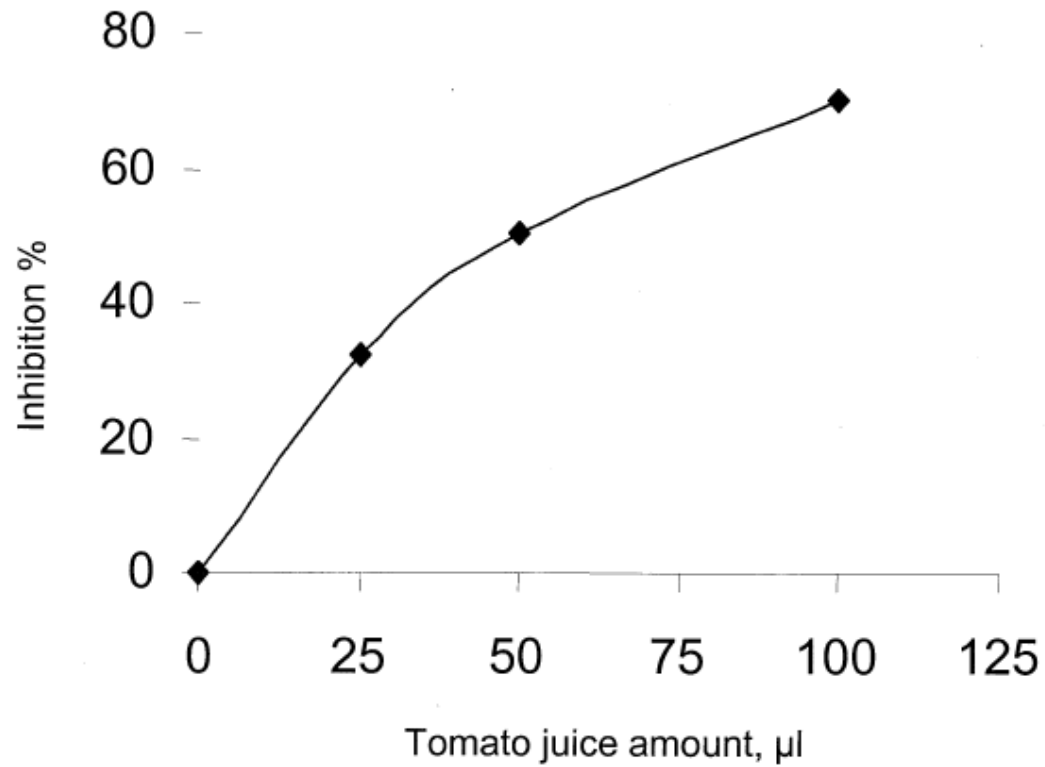


Fig. 2. Effects of different amounts of tomato juice on inhibition percent of ADA activities.

# Stinging nettle (urtica dioica=ısırgan otu)

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- **Urtica dioica: beta sitosterol içermektedir.**



Table 3: Inhibitory effects of urtica dioica on ADA activity ( mIU / mg ) in prostate tissue from patients with prostate cancer.

Amounts:	(Mean ± standart deviation)
A. No aqueous extract of urtica dioica	14.8 ± 6.8
B. 25 µl aqueous extract of urtica dioica	13.35 ± 4.24
C. 50 µl aqueous extract of urtica dioica	6.49 ± 2.38
D. 100 µl aqueous extract of urtica dioica	0.98 ± 0.76

Wilcoxon Signed Ranks Test

A-B	P>0.05
A-C	P<0.01
A-D	P<0.02
B-C	P< 0.01
B-D	P<0.02
C-D	P<0.02

Durak İ, Biri H, Devrim E, Sözen S, **Avci A.** Aqueous extract of urtica dioica makes significant inhibition on adenosine deaminase activity in prostate tissue from patients with prostate cancer. *Cancer Biology and Therapy*, **3(9)**: 855-7 (2004)

Table 4: Effects of different amounts of aqueous extract of urtica dioica on inhibition % values of ADA activities

Amounts:	Mean ± standart deviation
A. A. No aqueous extract of urtica dioica	0.0
B. 50 µl aqueous extract of urtica dioica	59.4 ± 9.2
C. 100 µl aqueous extract of urtica dioica	92.8 ± 5.3
Wilcoxon Signed Ranks Test	
A-B	P<0.02
A-C	P<0.02
B-C	P<0.02

# Triticum aestivum

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- Buğday çimi
- Çalışmanın Amacı: (*Triticum aestivum* L.) Buğday çiminin Baf3p210-E255K (imatinib-resistance) Kronik Myeloid Lösemi (CML) hücre serisi üzerinde etkilerini incelemek.

- Bu amaçla buğday çimi sıvı ekstresi (200 % w/v) son konsantrasyon % 10 olacak şekilde hücre ortamına eklendi.
- Başlangıç, 24. ve 48. saatlerde oksidan (malondialdehyde) MDA düzeyi
- Antioksidan (superoxide dismutase-SOD, catalase-CAT) parametreler ve
- ADA (Adenosine deaminase) aktivitesi ölçüldü.

# Sonuçları:

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- Ekstrenin ADA aktivitesinde inhibisyon yaptığı; fakat SOD ve CAT aktivitelerinde artışa yol açtığı gözlemlendi.
- Apoptoz gözlemlendi

EFFECT OF WHEATGRASS (TRITICUM AESTIVUM L.) ON  
OXIDANT/ANTIOXIDANT STATUS IN Baf 3p210-E255K CML CELL LINE.  
Gurleyik E , Ozkan T, Altinok B , Karadag A, Aydos S, Avcı A, Sunguroglu A

## Intended Uses of Common Herbal Medicines

Herbal Medicine	Intended Use
Ginseng	Tonic capable of invigorating users physically, mentally, and sexually; also used for dealing with stress; used in China for more than 5,000 y
Siberian ginseng	Similar to ginseng
St John's wort	Treatment of mood disorders, particularly depression
Ginkgo biloba	Mainly to sharpen mental focus in otherwise healthy adults and also in people with dementia; improvement of blood flow in the brain and peripheral circulation; treatment of diabetes mellitus–related circulatory disorders, impotence, and vertigo
Kava	Relief of anxiety and stress; sedative
Valerian	Treatment of insomnia
Echinacea	Immune stimulant that helps increase resistance to colds, influenza, and other infections; wound healing
Saw palmetto	Treatment of benign prostatic hypertrophy
Feverfew	Relief from migraine headache and arthritis
Garlic	To lower cholesterol levels and blood pressure; prevention of heart attack and stroke
Ginger	Prevention of motion sickness, morning sickness, and nausea
Cranberry	Treatment of urinary tract infection; decrease kidney stone formation
Aloe	To heal wounds, burns, skin ulcers; also used as a laxative
Senna	Laxative
Dong quai	To alleviate problems associated with menstruation and menopause
Cat's claw	Immunostimulant with antiviral activity; also used by people with AIDS; prevention of colds and influenza; treatment of chronic fatigue syndrome
Hawthorn	For heart failure, hypertension, and angina pectoris
Pokeweed	Antiviral and antineoplastic; eating uncooked berry or root may cause serious poisoning



# Bitkiler masum mu?

57

## Hamilelikte Bitki aylarının Olumsuz Yonleri:

- **Adaayı:**Bu donemde uterus kaslarını uyarıcı etkisi
- **Keten Tohumu:**Omega3 aısından zengin olmasına raėmen kanama riski
- **Ahududu:**C vitamini ve organik asitleri ierir, ancak doėum kasılmalarını bařlatıcı etkisi
- **Sinameki:**laksatif etkili ancak, vitamin, mineral emilimini azalttır.
- **Fesleėen, biberiye, yaban mersini, sarı kantaron, melisa yapraėı, aloe vera, karahindiba** gibi bitki ayları da hamilelik doneminde erken doėum, kanama ve düşük riskini artırır.

# bitkisellerin yan etkileri:

(58)

Heavy metal poisoning	Acute toxicity, encephalopathy
Hepatic disease	Fulminant liver failure
Cardiovascular disease	Cardiac arrhythmias, hypotension, hypertension, cardiac failure, acute transplant rejection, myocardial infarction, arteritis, pericarditis
Respiratory disease	Asthma
Gastrointestinal disease	Nausea, vomiting, diarrhea
Renal/Genitourinary disease	Urinary retention, interstitial nephritis, fulminant renal failure, acute transplant rejection.
Endocrine/metabolic disease	Hyperthyroidism, hypoglycemia, hyperglycemia, pseudohyperaldosteronism
Neurological disease	Confusion, coma, kernicterus, seizures, intracerebral hemorrhage/stroke, subdural- subarachnoid- extradural hemorrhage, encephalitis
Hematologic disease	Agranulocytosis, anemia
Miscellaneous	Anaphylaxis, carcinogenesis, postoperative hemorrhage
Drug interactions	



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Original communication

## Black and green tea – How to make a perfect crime



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### ABSTRACT

The antioxidant properties of the black and green tea are well known. The latent bloodstains are detectable by luminol. The bloodstains also can be cover up by drinks and foods containing the antioxidants; thus their presence can cause a decrease of the luminol light emission (false-negative results). The aim of this study was to quantify the light emission decrease of the chemiluminescent mixture prepared according to Weber (containing NaOH) and the chemiluminescent mixture of pH 7.4 (for the determination of the total antioxidant capacity) for the open air-dried sample. The black and green teas and white wine were used as the antioxidant's samples (high and low total antioxidant capacity). The significant decrease of the luminol chemiluminescent emission caused by the presence of the black and green teas (and comparable for both of them) was observed in comparison with the presence of white wine.

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## Black and green tea – Luminol false-negative bloodstains detection

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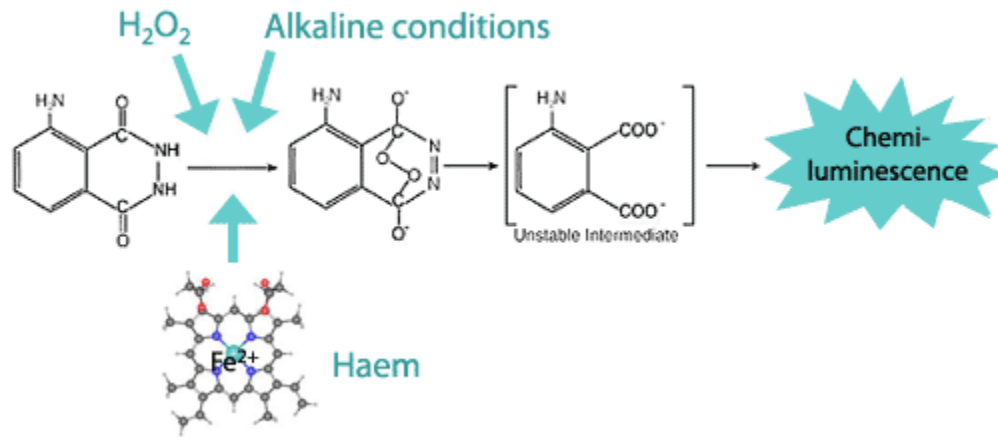
Bloodstain detection

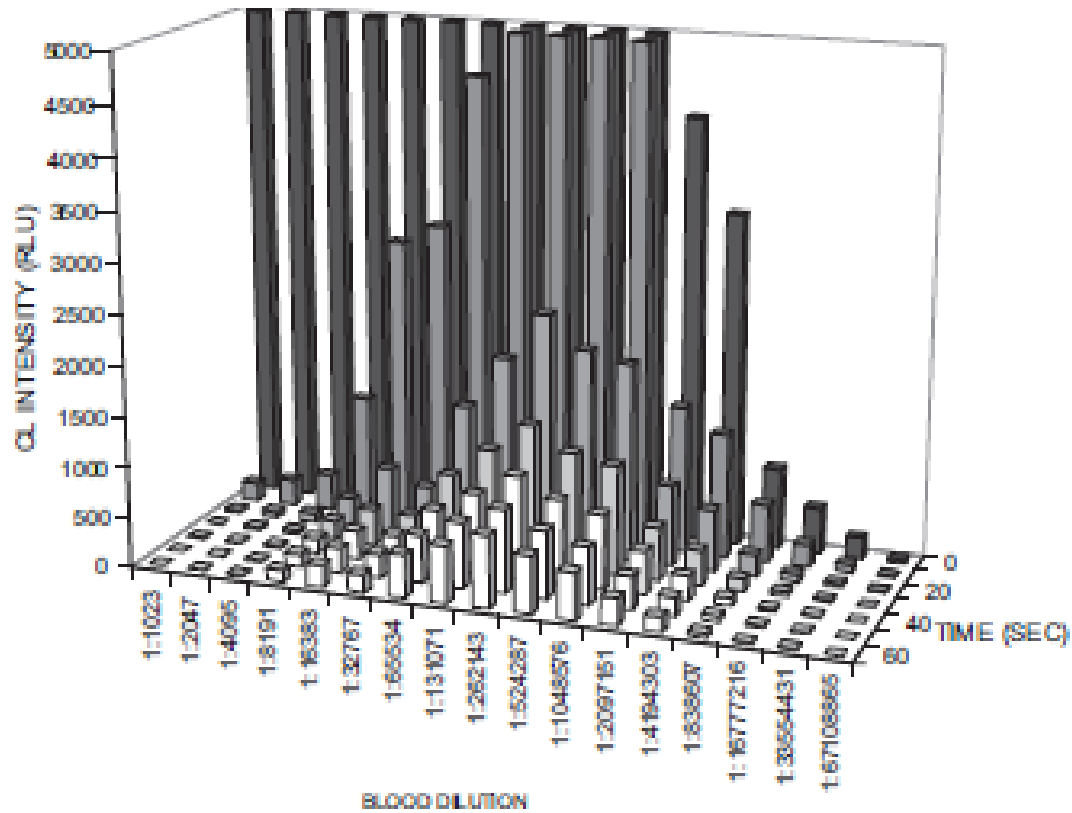
False-negative detection

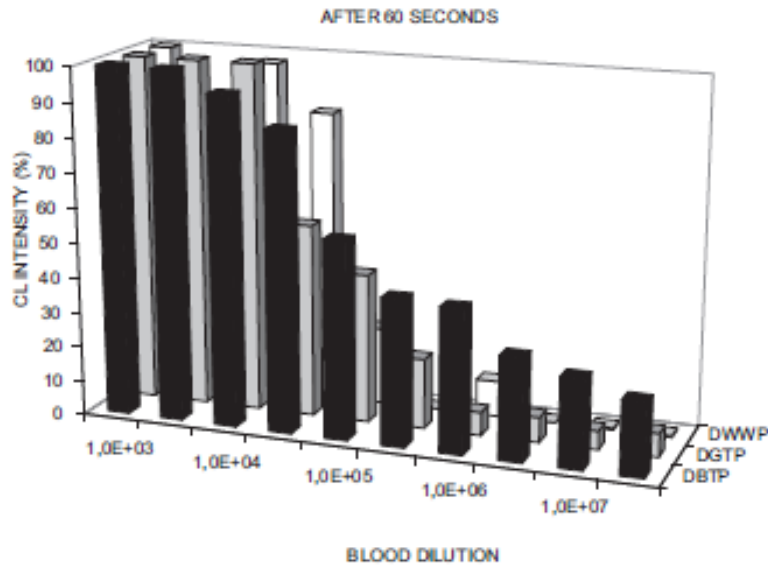
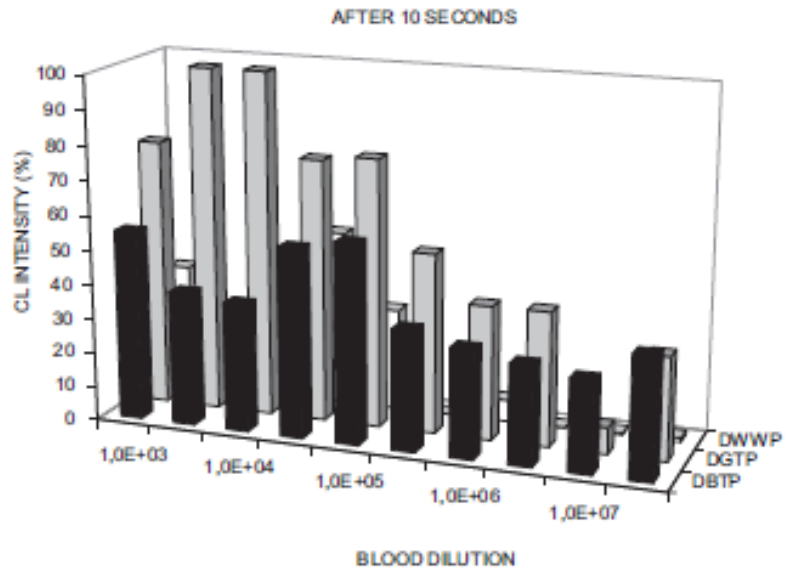
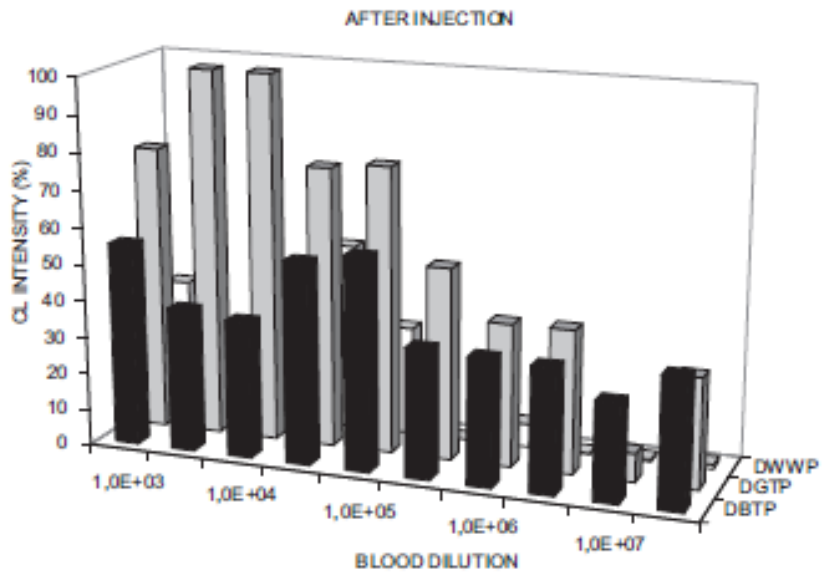
### ABSTRACT

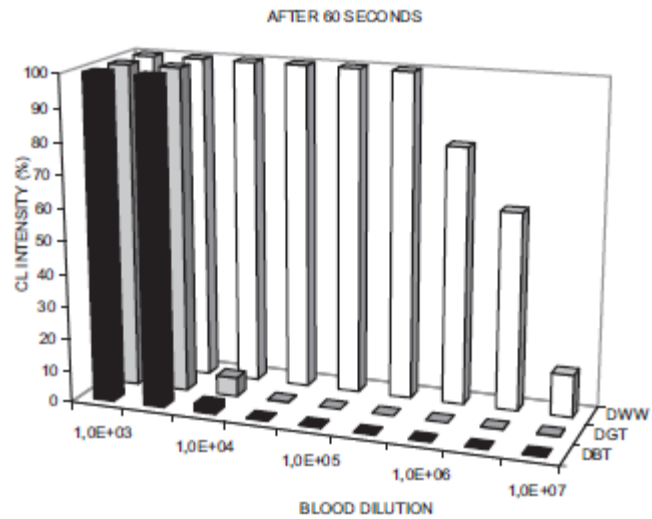
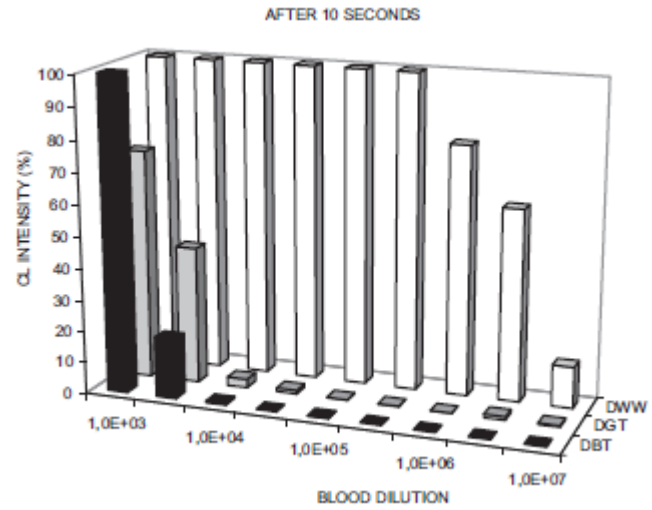
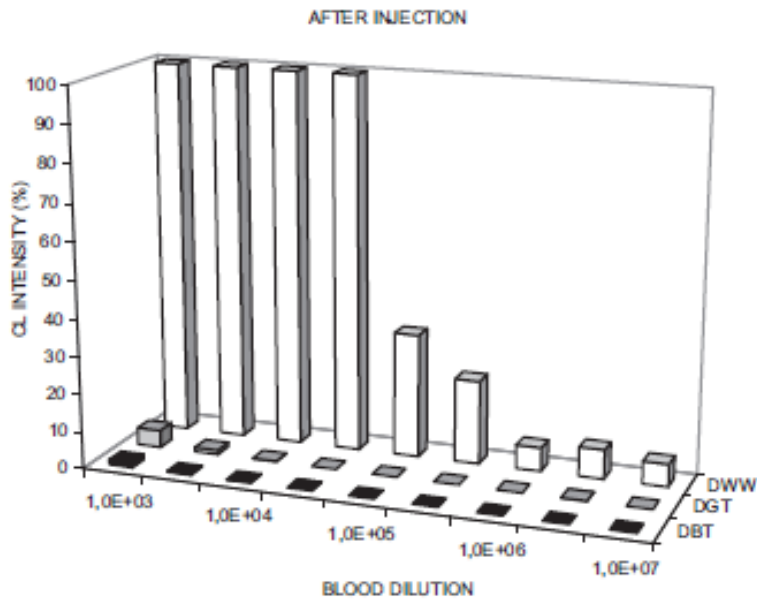
The antioxidant properties of black and green teas are well known. It is also possible to determine their antioxidant capacity by using a chemiluminescent method. This method is based on the measurement of the delay in the emission of light from the luminol reaction in the presence of the antioxidant. Bloodstains which are invisible to the naked eye can also be detected by luminol. Three common methods (detection using the Grodsky or Weber formulations and by Bluestar® Forensic latent bloodstain reagent) are based on the luminol chemiluminescence reaction. The bloodstains can be masked by drinks and/or foods containing antioxidants. The aim of this work was to compare the ability of black and green teas containing antioxidants to cause false negative results during chemiluminescent bloodstain detection.

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Teşekkürler.....